Assessment of Groundwater Abstraction for Factories in Klang, Selangor

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***Abstract*—Selangor is one of the most developed states in Malaysia based on industrial activities. Constant water supply to factories is a challenge for both authority and company manager. The reliable water source of groundwater is an option for companies in addition to the municipal water supply. To exploit the groundwater resources, Lembaga Urus Air Selangor (LUAS) requires the intended factories to conduct a comprehensive hydrogeological assessment. In the current study, the factories in Klang plan to abstract the groundwater for their plants. Therefore, the groundwater simulation is adopted to assess the negative impact from pumping activities. The conceptual model for the numerical simulation is developed based on the geological map, hydrogeological map, hydrological data, borehole logs, and static groundwater levels after well installations. The numerical model is successfully achieved with the root-mean-square error and correlation coefficient are less than 0.7 m and more than 0.9, respectively. The assessment results suggest the total pumping rate at the factories less than 7,200 m^3/d to avoid the negative impact to surrounding wells. The calibrated model is essential to assist the authority to manage the groundwater resources in Klang.**

Keywords—groundwater modeling, groundwater abstraction, Klang, Kenny Hill formation, weathered aquifer, fractured aquifer

I. Introduction

Industrial sector and water resources are key factors supporting economic activities in Malaysia. Many factories have been continuously established and invested, especially in Selangor State. Klang is one of well-known industrial and port hubs in Malaysia. Water resources are necessary for domestic consumption and industrial application. The sustainable water supplies to the factories are essential to ensure uninterrupted production lines. Therefore, additional water sources could sustain the factory demands. The industrial sectors significantly depend on two water sources. The water demands by factories are often fulfilled by municipal water supply networks. Interruption of supply takes place, especially during drought periods. On the other hand, another type of water sources is from a groundwater, nearby river, or spring. Many companies in Selangor State use groundwater to support their production activities. River and spring are similarly collected and treated for water usage in the factories.

The detailed study is at the factories in Klang where the groundwater abstraction for their plants (Fig. 1). The objectives of the study are to carry out the assessment of hydrogeological condition of the study site and surrounding area and to evaluate the potential impacts from 15 production wells with the total abstraction rate of 3,600 m^3/d.

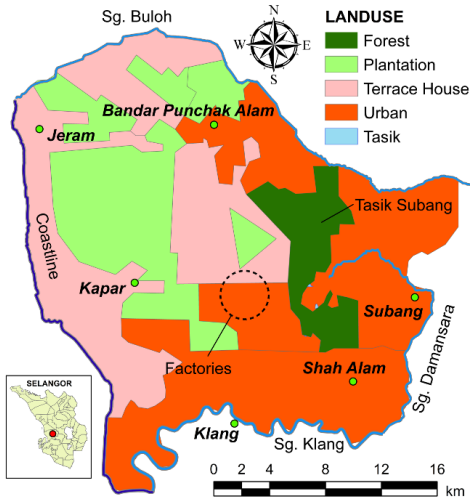

Fig. 1. Location of factories and landuse condition in Klang, Selangor

II. Methodology

A. Hydrogeological System

The hydrogeological system in the study site consists of several components. The ground conditions are prepared based on Digital Surface Model (DSM) from Japan Aerospace Agency (JAXA) with the resolution of 30m × 30m [1]. The river alignment and dimension, river stage, reservoir stage and rainfall are derived from Google Earth Pro, Public Web of InfoBanjir of Jabatan Pengairan dan Siliran (JPS) [2], Information Water Resources Management System (IWRMS) of Lembaga Urus Air Selangor (LUAS) [3], and [4], respectively. The geological condition of the study area is based on the geological map of Jabatan Mineral and Geosains Malaysia (JMG) [5]. The hydrogeological condition of the site is based on the hydrogeological map of JMG [6]. The study boundary is hydrogeologically controlled by Sg. Buloh at the north, Sg. Klang at the south, Sg. Damansara at the east, and coastline at the west from Port Klang to Jeram.

1) Topographical Condition

The ground surface condition within the study boundary consists of two (2) distinctive features. The lowland, ranging from 0 to 13 m above sea level (m ASL) extends from the center to the west, from the northeast to the north, from the southeast to the south. The highland area spreads from the center to the east. The elevation of the highland is from 14 to 320 m ASL. The factories exist on the ground elevation from 8 to 13 m ASL. Fig. 2 illustrates the topographical condition of around the study area.